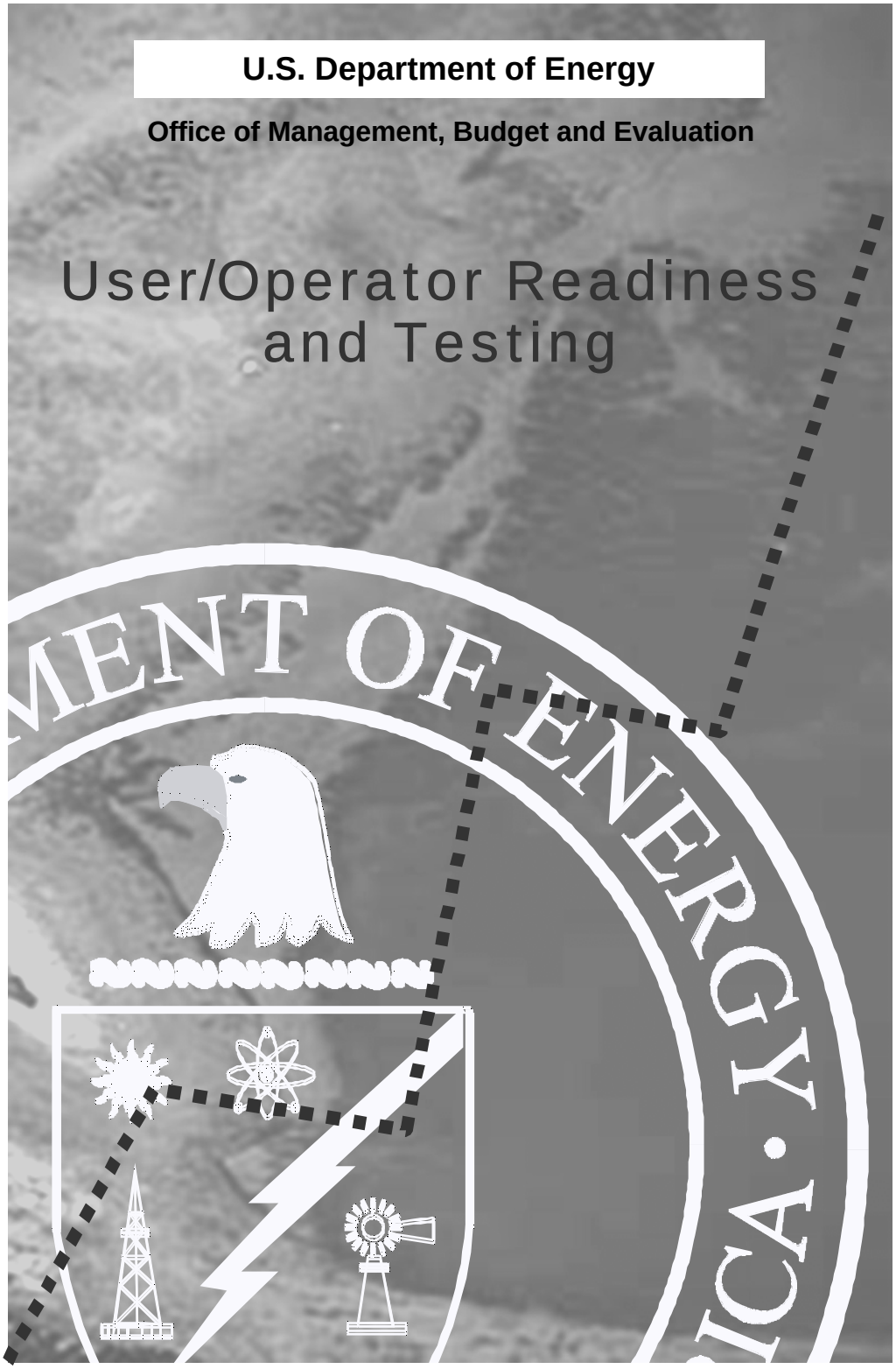
**U.S. Department of Energy**

**Office of Management, Budget and Evaluation**

# User/Operator Readiness and Testing



Initiated by: Office of Engineering and Construction Management

# USER/OPERATOR READINESS AND TESTING

The final stage of a project that provides operating system(s) or facilities includes testing and an Operational Readiness Review (ORR). Testing is performed to demonstrate structures, systems, and components/structures, systems, and equipment (SSC/SSE) meet or exceed established project requirements. An ORR independently confirms the readiness of personnel and procedures, and completed facilities, systems, and equipment to start or restart operations. A second difference between testing and an ORR is that testing is typically the responsibility of, and performed by, a DOE contractor, while an ORR is the sole responsibility of the DOE, even though a contractor may provide support.

## 1.0 TESTING AND STARTUP ACCEPTANCE

The purpose of the Execution phase of a project is to provide functional products or deliverables that operate as intended, meet established requirements, and fulfill the project's mission. This purpose cannot be achieved without a formal, documented commissioning process that includes transition to operation. This transition is best achieved by:

- Early project planning, organizing, and preparation for transition
- Systematically performing required inspections and testing
- Providing adequate documentation of testing and transition activities.

Typically, all aspects of a project are under the control of the project organization, with oversight by the user organization. By the time transition is complete, however, the project organization has relinquished all control of the project's products and deliverables, and the user organization and its operations and maintenance staff have assumed total responsibility and control of these products and deliverables. To assure a safe, effective, and efficient transition and turnover, jurisdictional control of all structures, systems, and components must be clearly defined, documented, and controlled throughout the transition process. The project manager (PM) and user authority are responsible for developing and implementing a jurisdictional control system that is appropriate for the size, complexity, and operational status of the project's construction activity as well as all other associated activities. If construction activities involve tie-ins to existing functional systems that will remain operational, the jurisdictional control process should be described in detail to avoid accidents and incidents. For construction activities that involve multiple "functional systems," the jurisdictional control process should address control of each "functional system." The jurisdictional control system should be described in the Project Execution Plan In addition, a separate transition plan may be desirable depending upon the number, size, and complexity of the structures, systems and equipment being transitioned. DOE has published a "Model Commissioning Plan and Guide

Specifications," Version 2.05, to assist in Federal building commissioning that may prove useful in planning and performing transitions.

## 2.0 PLANNING

Planning for project transition to a user is an integral part of project planning and performance activities, and needs to begin during the Initiation phase of a project. For example, design and construction need to be planned and performed so that components, systems, and structures, including infrastructure and utilities, are completed in a logical sequence that supports testing and operation. In addition, design should ensure access to equipment and systems by test personnel and test equipment; flushing and hydrostatic testing accommodations such as water connections, high-point vents, low-point drains; and test solutions collection and disposal systems. Planning also needs to include the identification of resources and requests for funds to perform the required activities. Resources include personnel, procedures, equipment and supplies. Without proper planning and preparation or adequate funding, transition and turnover can prove unsatisfactory.

Although turnover of a completed facility is preferred, because of the phased nature of construction projects, phased (partial) transfers/turnovers may be necessary. Phased turnovers are acceptable if cost-effective and beneficial to the user. Phased turnovers could include equipment items, operating systems, or facility areas. They also generally involve the construction contractor, and thus jurisdictional disputes with the construction crafts must be planned and avoided.

A properly planned and implemented project transition and turnover develops ownership within the user organization as the user participates in turnover activities. It also serves as a mechanism for transferring ownership from project to user.

## 3.0 TYPICAL STARTUP TESTING ACTIVITIES/LOGIC

Regardless of the project, there are typical activities or elements that, when complete, can result in an orderly project transition and commissioning process. This Practice, however, imposes no requirement to the typical activities and logic. If the PD/PM believes the typical process would be beneficial for their project, it may be followed, or it may be tailored to meet the needs of the project.

### 3.1 Functional Systems

As soon as adequate detailed design and design basis documentation is available, the SSEs should be divided into "functional systems." This breakdown should coincide with the project's work breakdown structure. A "functional system" consists of a group of components that when taken together forms a logical system that allows meaningful testing to be performed. The "functional system" breakdown may or may not correspond to the permanent

plant system breakdown. For some projects (e.g., minor construction activity), there may be a single "functional system." For large complex, formal projects, there may be many "functional systems." For all projects, however, the sum of all "functional systems" equals the total of all project-testing activities.

## 3.2 Logic for Testing Sequence

Projects that have multiple "functional systems" usually have to be tested and started in a particular logical sequence. (As an example, if System A provides electrical power to a motor in System B, then System A must be tested and started prior to testing and starting System B.) Establishing the "functional system" logical testing and startup sequence is a prerequisite to developing the testing and startup plan and critical path schedule.

Developing the project's testing and startup plan should begin early in the project's life cycle, because testing and startup activities must be integrated with a number of other project activities, including:

- Project schedule preparation
- Project funding requests
- Design document completion
- Procurement and construction package completion
- Procurement and construction contract awards and completion schedules
- Test procedure preparation, approval, and performance
- Test team formation and training
- Support infrastructure and utility availability
- Test equipment identification and procurement
- Testing materials and supplies
- Disposal of testing wastes, e.g., water
- User support.

## 3.3 Develop Critical Path Startup Schedule

Each "functional system" should be evaluated to establish a reasonable startup testing duration. Test durations, combined with the sequence logic, are used to develop a critical path-testing schedule. This schedule establishes the date when each complete "functional system" is needed. Once the "functional system" need dates are established, they should be clearly communicated to the construction organization so that construction activities can be focused and directed to produce the "functional systems" as needed to support the startup effort. Additional activities that support the critical path schedule include identifying measurable

milestones, estimating test team personnel needs (number and skills), and a cost estimate for each test.

## 3.4 Integrate Construction Schedule and Startup Schedule

For large, formal projects (where procurement and construction may take years), construction management's focus should shift as the project progresses. For most of the physical construction period, construction management's focus is typically on procurement and bulk quantity installation (e.g., cubic yards of concrete, tons of structural steel, feet of pipe). As physical construction approaches approximately 20 percent complete, and startup "functional system" requirements become known, the focus should shift to "functional systems" completion and turnover. Typically, the physical construction schedule does not contain easily identifiable "functional systems." Therefore, for construction having multiple "functional systems," considerable construction schedule refinement is frequently required to integrate the construction schedule with the turnover, testing, and startup schedule. This refinement of the construction schedule as construction progresses is a normal part of the project's transition to the user and should be anticipated, planned, scheduled, and estimated.

## 3.5 Provide "Construction Complete" Functional Systems

For startup activities to progress smoothly and rapidly, construction complete "functional systems" should be made available as scheduled and when needed. Supporting the startup schedule (i.e., providing construction complete "functional systems" when needed) becomes the construction organization's prime objective as construction approaches completion.

As "functional systems" become "construction complete" and are made available for functional performance testing, a jurisdictional transfer (from the construction organization to the testing organization, test engineer, and/or user organization) occurs. The jurisdictional transfer allows the testing organization, test engineer, and the user to control the status of the system and aids in restricting construction personnel from physically changing transferred systems. It also provides a distinct boundary between test personnel and test activities, and construction personnel and construction activities. For large formal construction projects, a formal, documented process for system jurisdictional control should be established.

As functional and system performance testing begins, a new category of safety hazards is introduced into the project. Since physical construction activity will necessarily occur in parallel with testing, safety hazards associated with construction will exist. In addition, as systems are tested and operated, hazards exist in the form of temperatures, pressures, and energy. Therefore, the relationships and interfaces between testing and construction should be documented and well understood to ensure the safety of construction and testing personnel. The startup plan should include scheduled pre-startup and functional performance test meetings prior to commencing test activities, and similar meetings upon completion of test activities.

During the period of time testing and construction occurring simultaneously, the test and construction organizations should remain in close, continuous contact so the necessity to change the testing/turnover plan because of either testing or completion needs can be identified early and alternative plans and schedules developed and implemented.

## 3.6 Project/Construction Interface

The project/construction interface is an area important to the success of a project. It is also an area that, unless properly planned, managed and implemented, can cause significant problems and delays.

During the project/construction interface period, the constructor needs to be able to complete the construction contract without interference. At the same time, however, the project needs to have access to construction areas and activities to evaluate progress, witness performance, become familiar with the products of the construction effort, and prepare for testing and turnover activities. The project's purpose is to remain sufficiently knowledgeable to respond to questions that arise during construction, procurement, and installation; and remain sufficiently familiar to prepare test procedures and perform effective acceptance tests.

The project/construction interface can be satisfactorily managed if it is properly planned and understood. Suggestions to help assure a problem-free interface include:

- Work closely with the construction contractor to identify needs and priorities
- Identify an interface person within each organization to coordinate project personnel access to the construction area
- Establish minimum requirements for construction area access, including notification, safety requirements, training, access routes, and accessible area
- Identify and implement a mechanism for quickly identifying and resolving differences and difficulties
- Develop guidance and agreements that provide for test team access.

If the construction forces include union crafts, then agreements become even more important, since misunderstandings can lead to walk-offs, strikes, and in extreme cases, violence.

The key to effective implementation of facility access is to develop a "team" attitude in which all parties to the agreements are able to gain from full cooperation.

## 3.7 Test Teams

Testing is best performed by test teams that include project and user personnel. Test teams should be organized and trained by the test team leader as assigned by the PM. The team leader is generally the project person who was assigned responsibility in the project's

responsibility/authority matrix for the system being tested, e.g., HVAC. The PD/PM delegates the authority necessary to perform the test to the team leader.

Ideally, the team leader should select the test team members, based on their experience and knowledge. As necessary, the team could include safety, quality, and environmental personnel. The team leader, with the test team, is responsible for preparing a test procedure for the system being tested. The team leader is also responsible for preparing a test schedule and cost estimate and reporting progress against these baselines; organizing the test effort, including making team assignments; providing necessary training; identifying and obtaining needed test supplies and equipment; performing the test; coordinating and integrating the test with construction and other tests being performed; and providing weekly cost and schedule performance reports.

During testing, the PM supports the test team(s) by ensuring all needed materials, supplies, test equipment, and support are provided as needed by the test team. The purpose is that once a test begins, the PM and the team leader need to make every effort to avoid unnecessary distractions or interruptions.

During test performance, the team leader is not only responsible for performing the test, but also for obtaining needed test data and identifying necessary corrective actions, reviewing and approving the completed test, and obtaining management approval of the completed test.

## 3.8 Prepare Test Procedures

Part of the testing effort includes identifying test requirements and acceptance criteria. This information is provided in the design basis and other engineering and design documentation. These criteria and requirements should be identified for each “functional system” as a prerequisite to developing a test procedure. A single test procedure or multiple test procedures (e.g., Acceptance Test Procedure, and Operational Test Procedure) may be developed for each “functional system.” These procedures should be incorporated in the test plan, which is part of the more comprehensive startup plan. Test program and procedure requirements include:

- Tests can be controlled, planned, performed, and documented
- The project organization provides test requirements and acceptance criteria
- Test procedures are reviewed and approved in accordance with applicable requirements, generally by both the project and the user organization
- Acceptance testing is witnessed and/or inspected by personnel who are independent of the organization performing the work
- Test results are documented
- Test results are evaluated for acceptability by the project and/or the user organization
- Discrepancies or failures are documented, reviewed, corrective actions identified, and the test (or a portion of the test) repeated.

Test procedure approvals fall into three distinct categories:

- Approval of the test procedure prior to use, which documents that the test procedure is adequate for its intended purpose
- Step-by-step sign-off of the procedure as testing is performed, which documents that each step (or group of steps) has been performed (and witnessed if required) and that specified test data has been collected
- Review, analysis, and approval of test results, which documents that system performance has been achieved (acceptance and functional criteria have been met).

Consideration should be given to obtaining review and/or approval of test procedures from the user organization. This is particularly appropriate if the user will be involved in performing the test.

## 3.9 Checkout

Checkout is an activity that is performed largely in parallel with testing, but must be completed prior to testing and prior to acceptance from the construction. Early transition and turnover activities include facility walk-downs for identification and correction of deficiencies; planning, preparation, performance, and documentation of structures and systems; and equipment testing and operation. This activity is generally titled checkout.

Equipment, systems, and facility checkouts/walk-downs are a combined effort involving the construction entity and the project organization. The purpose of a walk-down is to identify deficiencies. The bases of a walk-down are approved design and construction documents. Walk-downs are performed by establishing combined project/construction/user teams to review and inspect structures, systems, and components, and comparing the “completed product” against approved requirements and design documents. Discrepancies and deficiencies are documented, corrective actions identified, responsible individuals assigned, and a corrective action completion date identified. Deficient items are tracked to completion and then re-inspected for acceptability. Identification and correction of safety deficiencies shall be a key component of all checkout/walk-down activities. Funding for this activity is a project responsibility. Funding for corrective actions is also a project responsibility, unless new work scope is involved.

## 3.10 Construction Acceptance Testing

Construction/installation acceptance testing is designed to test and document that physical installation has been completed in accordance with approved engineering and design documents. It is performed prior to functional performance testing. Because construction acceptance testing is typically a component, not a system operation, it provides limited assurance of the adequacy of a constructed product to perform its intended function (i.e., a correctly built design may not perform acceptably). Generally, construction acceptance tests

are the responsibility of the construction contractor. These tests are usually witnessed and verified by the project.

For formal construction projects, construction acceptance testing is performed in accordance with approved test procedures. Typical construction acceptance testing activities (depending on the particular system being tested) include visual inspections, continuity checks, verification of equipment rotation, vibration and alignment, filling and flushing, hydrostatic pressure testing, instrument and control calibration, and loop checks. Documentation for these activities may include signed off installation verification forms or checklists. These forms or checklists should be signed off by the installation technicians and/or the construction manager. Results from construction acceptance testing are evaluated to ensure that requirements have been met.

Frequently, the construction activity involves interfaces with existing structures, systems, and components (e.g., modification or addition to existing facilities). Testing activities that have the potential to affect an existing facility are closely coordinated with the facility to ensure that unplanned (and potentially unsafe) conditions do not occur. This applies to both acceptance and functional performance testing. All testing activities are planned and conducted to support applicable conduct of operations requirements. In accordance with the Integrated Safety Management System, safety hazards that may occur as a result of testing are identified, analyzed, and controlled prior to the start and during the performance of each test. Particular care is exercised when nuclear materials are involved that have the potential to create a critical or contamination incident.

## 3.11 Fuctional Performance/Operational Testing

Testing verifies technical performance. The PM prepares (or has prepared) operating and acceptance test procedures, performs and/or witnesses tests, documents test results, and completes all required corrective actions. Test teams that include project and user personnel perform testing. Testing serves three valuable purposes: (1) verify that the structures, systems, and components meet design requirements (acceptance tests); (2) verify correct SSC operation (operational tests); and (3) train user personnel in the arrangement, location, control, and operation of the completed facility.

A test lead is identified, organized, and trained by the PM for each test. The PM is also responsible for organizing test work in an efficient and effective manner. Overall, the work should be organized such that testing progresses naturally from components and equipment to systems, and culminates with an integrated facility and process cold operation.

Safety must be a key consideration of the team leader and the test team, because testing involves significant safety hazards: electrical, pressure, temperature, heights, operating equipment, etc. The team leader must provide safety training and safety equipment and devices for the team. Each test must begin with a safety walk-down of the facility, equipment, and system involved in the test to review, discuss, understand, and resolve safety concerns. Each

test shift/day must begin with a brief safety meeting to review test status and possible new safety hazards.

The test procedure is prepared so that as a test proceeds, it progresses from component to item to system operation. The steps in the test also serve to verify item and system requirements. These requirements are obtained from design and procurement documents as well as project requirement documents. As each requirement is verified, the verification is documented by the team leader's initials and the date.

If a test involves multiple shift operation, the team leader must assure that comprehensive, informative shift change meetings are planned and held. The purpose of these meetings is to assure that the new shift is fully aware of the test status, process condition, next test steps, and any associated hazards.

If there are open items that remain following testing, the team leader is responsible for planning and performing all required closure actions. When the test is complete, the team leader certifies completion by signing and dating the test procedure. The PM then reviews the test package and also approves the test. All test documentation is maintained in the project files.

Once all associated tests are complete, a system or process can then progress immediately to a cold run that is generally the final test prior to hot operation.

## 3.12 Corrective Actions

Should performance of the test identify deficiencies in the structure, system, or equipment being tested, the team leader is responsible for identifying and documenting any deficiencies and proposing a corrective action. If the corrective action is within the project's scope of work and performance baselines, the proposal can usually be approved by the PD/PM. However, if the corrective action is new scope or outside the project's cost and schedule baselines, the team leader is responsible for preparing a change request and submitting and explaining the request to the appropriate project change board. Upon approval of the change proposal, the team leader is responsible for implementing the change and performing additional testing as required.

## 3.13 Review, Analyze, and Approve Test Results

Approval of functional and operational test results is a major milestone for any project. Successful results from functional and performance testing ensures that the project's products and deliverables are capable of achieving the functional and performance requirements as defined in technical baseline documents.

### 3.14 Prepare for Facility Startup

Functional and operational performance testing is designed to measure and document the adequacy of the constructed or installed system(s) to perform their intended function(s) and is focused on the functional adequacy of installed hardware.

Facility startup readiness (which occurs after functional performance testing) expands the focus to include not only hardware, but also the adequacy of personnel, procedures, and administrative processes necessary to support and maintain safe operation. Assessment of the need for a readiness review takes place early in the project, so that the review can be adequately planned, staffed, and performed upon completion of checkout, testing, and turnover.

## 4.0 READINESS ASSESSMENT AND OPERATIONAL READINESS REVIEW

Each DOE project may be required to perform a Readiness Assessment (RA) or an ORR prior to obtaining a Critical Decision 4, Approve Start of Operations or Project Closeout. The purpose of these reviews is to independently ascertain the readiness of a "completed project" to begin operation. Thus, the importance of the RA/ORR process cannot be overemphasized.

Several DOE documents describe in detail the requirements of and the approach to planning, organizing and performing a RA and an ORR. The most important of these documents are:

- DOE O 425.1A, Startup and Restart of Nuclear Facilities
- DOE-STD-3006-95, Planning and Conduct of Operational Readiness Reviews
- DOE Handbook, DOE-HDBK-3012-94, Team Leader's Preparation Guide for Operational Readiness Reviews

These documents also identify the criteria for determining whether or not either of these reviews is applicable to a specific project. However, one criterion for determining whether or not a review is required is "when deemed appropriate by DOE management officials, including restarts of Hazard Category 3 nuclear facilities." No project should assume that it would not be subject to one of these reviews before being permitted to start or restart operation. Therefore, an early and important responsibility of the PD/PM and the Integrated Project Team is to determine and document whether or not a startup/ restart review will be required, and if so, the type of review that will be required. Typically, this discussion and agreement is not addressed until late in the project lifecycle (perhaps even as late as turnover and startup testing), thus almost certainly assuring the effort (when performed) is more haphazard, stressful, and time and resource consuming than necessary.

An ORR is a disciplined, systematic, documented, performance-based examination of facilities, equipment, personnel, procedures, and management control systems to ensure a facility can be operated safely within its approved safety envelope as defined by the facility

safety basis. The ORR scope is defined based on the specifics of the facility and/or the reason for the shutdown and start/restart as related to a minimum set of core requirements. A graded approach should be used in defining the depth of the ORR based on these core requirements.

An RA is a review conducted to determine a facility's readiness to startup or restart when an ORR is not required, or when a contractor's standard procedures for startup are not judged by contractor or DOE management to provide an adequate verification of readiness.

## 4.1 Planning

A significant challenge associated with DOE projects is planning and managing the transition of a project from construction to operation. The scope, schedule, cost, and advance planning required to achieve readiness to conduct operations, and then conduct the required readiness review to obtain approval to begin operation, are generally not well understood. As a result, these efforts are frequently frustrating and become more time and resource consuming than envisioned, leading to a project exceeding its cost and schedule baselines.

As with any other project activity, both an RA and an ORR should be planned, assigned, scheduled, estimated, and managed as a sub-project within the larger project. RA/ORR activity planning should begin early in the project lifecycle; ideally no later than Conceptual Design. This planning should include assigning a responsible individual for the project's RA/ORR activity; developing and issuing a scope of the intended review; ensuring the activity is included in the project's WBS and WBS dictionary; preparing a conceptual resource loaded schedule with milestones; and preparing a conceptual cost estimate. The individual assigned responsibility for an RA/ORR should also be identified. That individual ensures that the overall RA/ORR effort is tailored, so the effort will be adequate and appropriate to the needs of the project, the Operating organization and the DOE.

## 4.2 Coordination

The individual assigned responsibility for the RA/ORR (RA/ORR lead) may be either a project or Operations person. However, to ensure adequate, continuing oversight and progress, the overall responsibility should reside with the PD/PM. This is so that the RA/ORR effort can progress along with the project, and the PD/PM can be sure neither is being neglected or ignored.

Regardless of where the responsibility for planning and implementing the RA/ORR resides, it must be a team effort with the minimum team members being the project, the Operating organization and the DOE. All three must be continuously involved to ensure that planning and preparation are complete, that all involved organizations are fully informed and in agreement on the type of review to be performed, and that all agree upon the schedule, cost, and scope of the review.

Because both an RA and an ORR is in large measure a review of project documentation, a vital function of the RA/ORR lead is to ensure that project documentation is identified, approved (as appropriate), filed, and maintained throughout the project. Also, that documentation is maintained in a centralized, controlled location and is readily retrievable on short notice, if and when needed.

A successful RA/ORR also requires communication and coordination among several organizations, including major contractors and subcontractors, DOE Headquarters, DOE Field Office/Operations Office, State agencies and regulatory agencies.

## 4.3 Documentation

A desirable (but not mandatory) activity for the RA/ORR lead would be to prepare an abbreviated "Project Execution Plan" or an "RA/ORR Execution Plan" for the ORR/RA activity. This plan need not be excessive or lengthy, and may be tailored to the needs of the activity. If prepared, the plan would include determination of the review to be performed; the proposed schedule; estimated cost; key personnel expected to be involved; anticipated personnel training requirements; scope of the review; the depth of the review; required supporting documentation; and necessary approvals. This document should be maintained current as the project progresses to reflect changes in early assumptions, funding, personnel, requirements, etc.

In some cases, a contractor's RA/ORR or management assessment may be required. If required, these reviews must precede any DOE review. In these cases, a contractor's plan-of-action is prepared and approved by the appropriate startup or restart authorities. The plan-of-action is prepared and submitted four to six months before the start of the review. The plan-of-action should specify the prerequisites for starting the review; provide the proposed breadth of the review; identify the core requirement determined to be applicable to the review; identify the review schedule, including estimated start date and duration; identify the proposed review team leader; and other information unique to the proposed review as required by DOE Order 425.1.

A review Implementation Plan is prepared following the approval of the plan-of-action. The Implementation Plan is the plan for conducting the review and the rationale for that process. This Plan should include the selection of review criteria, review approaches and the procedures by which the team will develop findings and conclusions, review checklists, evaluation criteria, documentation methodology, qualification requirements for team members, etc, as necessary, to efficiently execute the review and report the results.

The final product of the review is the Final Review Report. This report documents not only findings and conclusions, but also the process by which these were developed. The Final Report should also include an executive summary, lessons learned, and appropriate appendix. The Final Report is the deliverable from the review. It is the basis for senior management

decisions, including startup or restart approval authority, and therefore must accurately reflect the conditions found during the review.

The DOE performed review follows a similar path to that of the contractor review. The DOE selects and trains its own team leaders and members, and develops its own plan-of-action, implementation plan and final report. However, the contractor documents are available to the DOE team for use in preparing and performing its review. In addition, the contractor provides support to the DOE review team, including office space; furniture; communications devices (computers, printers, copiers, and telephones); tours and guides; access permits and badges; training; and word processing.

## 4.4 Training

The contractor and DOE select RA/ORR review team leaders and team members for their respective reviews. Training of team members is generally the responsibility of the team lead, but may require the support of the appropriate training organization. The project organization may also be involved in training the review team, particularly in those areas related to the completed facility and its technical, operational, maintenance, quality and safety requirements.

The review team should be composed of a multi-disciplined team of experts, including individuals knowledgeable in public and worker safety and health, and environmental protection. Team members are generally individually chosen by the team leader to ensure that collectively their backgrounds include the important facets to be reviewed. Technical experts to support the team should also be chosen to ensure the team covers all functional areas required by the RA/ORR breadth as defined in the plan-of-action. The number of team members is determined by the scope of the review and the size and complexity of the facility.

## 4.5 Readiness Assessment

A RA is a review conducted to determine a facility's readiness to startup or restart when an ORR is not required, or when a contractor's standard procedures for startup are not judged by the contractor or DOE management to provide an adequate verification of readiness.

For restarts of nuclear facilities not requiring an ORR, as defined in Order 425.1A, DOE line management evaluates (and ensure that contractor management evaluates) the need for performing an RA prior to restart. This includes the startup or restart of program work associated with operating facilities when the new or restarted program work does not require DOE approval of changes to facility limits or requirements as stated in authorization basis documents. When a RA is required, Field/Operations Offices develop procedures and ensure that contractors use the procedures to gain Operations Office approval of the startup or restart of nuclear facilities. If an RA is not to be performed, the contractor's standard procedures for startup or restart are used.

## 4.6 Operational Readiness Review

The ORR scope is defined, based on the specifics of the facility and/or the reason for the shutdown as related to a minimum set of core requirements (Table 1). A graded approach is used in defining the depth of the ORR, based on these core requirements.

DOE line management determines (and ensures that contractor management determines) if ORRs are required for the startup of new nuclear facilities or restart of a nuclear facility. DOE conducts (and ensure that contractors conduct) a management assessment in accordance with DOE Order 425.1A, when an ORR is required.

**Table 1. Minimum Core Requirements**

Each of the minimum core requirements listed below shall be addressed when developing the breadth of an Operational Readiness Review. Justification shall be provided in the plan-of-action if it is determined that a particular core requirement will not be reviewed. The plan-of-action may reference a timely, independent review that addresses the requirements in a technically sound manner to justify not performing further evaluation of a core requirement during an Operational Readiness Review.

| Item | Requirement |
|---|---|
| 1 | There are adequate and correct procedures and safety limits for operating the process systems and utility systems. |
| 2 | Training and qualification programs for operations and operations support personnel have been established, documented, and implemented. (The training and qualification program encompasses the range of duties and activities required to be performed.) |
| 3 | Level of knowledge of operations and operations support personnel is adequate based on reviews of examinations and examination results and selected interviews of operating and operations support personnel. |
| 4 | Facility safety documentation is in place that describes the “safety envelope” of the facility. The safety documentation should characterize the hazards/risks associated with the facility and should identify mitigating measures (systems, procedures, administrative controls, etc.) that protect workers and the public from those hazards/risks. Safety systems and systems essential to worker and public safety are defined and a system to maintain control over the design and modification of facilities and safety-related utility systems is established. |
| 5 | A program is in place to confirm and periodically reconfirm the condition and operability of safety systems, including safety-related process systems and safety-related utility systems. This includes examinations of records of tests and calibration of safety systems and other instruments that monitor limiting conditions of operation or that satisfy Technical Safety Requirements. All systems are currently operable and in a satisfactory condition. |
| 6 | A process has been established to identify, evaluate, and resolve deficiencies and recommendations made by oversight groups, official review teams, audit organization, and the operating contractor. |
| 7 | Formal agreements establishing requirements are in place between the operating contractor and DOE, via the contact or other enforceable mechanism, which govern the safe operations of the facility. A systematic review of the facility’s conformance to these requirements has been performed. These requirements have been implemented in the facility, or compensatory measures are in place, and formally agreed to during the period of implementation. The compensatory measures and the implementation period are approved by DOE. |
| 8 | Management programs are established, sufficient numbers of qualified personnel are provided, and adequate facilities and equipment are available to ensure operational support services (e.g., |

| Item | Requirement |
|---|---|
| | training, maintenance, waste management, environmental protection, industrial safety and hygiene, radiological protection and health physics, emergency preparedness, fire protection, quality assurance, criticality safety, and engineering) are adequate for operations. |
| 9 | A routine and emergency operations drill program, including program records, has been established and implemented. |
| 10 | An adequate startup or restart test program has been developed that includes adequate plans for graded operations testing to simultaneously confirm operability of equipment, the viability of procedures, and the training of operators. |
| 11 | Functions, assignments, responsibilities, and reporting relationships are clearly defined, understood, and effectively implemented with line management responsibility for control of safety. |
| 12 | The implementation status for DOE 5480.19, CONDUCT OF OPERATIONS REQUIREMENTS FOR DOE FACILITIES, of 7-9-90, is adequate for operations. |
| 13 | There are sufficient numbers of qualified personnel to support safe operations. |
| 14 | A program is established to promote a site-wide culture in which personnel exhibit an awareness of public and worker safety, health, and environmental protection requirements and, through their actions, demonstrate a high-priority commitment to comply with these requirements. |
| 15 | The facility systems and procedures, as affected by facility modifications, are consistent with the description of the facility, procedures, and accident analysis included in the safety basis. |
| 16 | The technical and managerial qualifications of those personnel at the DOE Field organization and at DOE Headquarters who have been assigned responsibilities for providing direction and guidance to the contractor, including the Facility Representatives, are adequate (DOE ORR only). |
| 17 | The breadth, depth, and results of the responsible contractor ORR are adequate to verify the readiness of hardware, personnel, and management programs for operations (DOE ORR only). |
| 18 | Modifications to the facility have been reviewed for potential impacts on procedures, and training and qualification. Procedures have been revised to reflect these modifications and training has been performed to these revised procedures. |
| 19 | The technical and management qualifications of contractor personnel responsible for facility operations are adequate. |
| 20 | DOE Operations Office Oversight Programs, such as Occurrence Reporting, Facility Representative, Corrective Action, and Quality Assurance Programs are adequate (DOE ORR only). |

### *4.6.1 Operational Readiness Review Documentation*

DOE line management requires contractors to prepare the following documents for ORRs: startup/restart notification reports, plans-of-action, ORR implementation plans, and final reports. DOE line management prepares its plans-of-action, and ensures the ORR team leaders prepare ORR implementation plans, and final reports. The resolution of all findings from the ORRs is documented and maintained with the plans-of-action, implementation plans, and final reports.

### *4.6.2 Breadth of Operational Readiness Review*

DOE line management develops (and ensures the contractor develops) the breadth of the ORR and documents it in each plan-of-action. A minimum set of core requirements is addressed when developing the breadth of the ORR. The plan-of-action may reference a timely,

independent review that addresses the requirement in a technically satisfactory manner to justify not performing further evaluation of a core requirement, or portion thereof. During conduct of the ORR, the breadth may be expanded by the ORR team, if appropriate.

### *4.6.3 Operational Readiness Review Plans-of-Action, Approval, and Content*

The contractor and DOE ORR plans-of-action are approved by the startup or restart authorities. DOE line management ensures the contractor's plan-of-action specifies the prerequisites for starting the responsible contractor's ORR; and the prerequisites address each minimum core requirement determined to be applicable when developing the scope of the ORR. The DOE plan-of-action specifies additional prerequisites, such as a certification of readiness to oversee facility operations by Operations Office and Headquarters management.

### *4.6.4 Operational Readiness Review Teams*

DOE line management appoints (and ensures that contractor management appoints) ORR teams in accordance with the following qualifications and training requirements:

- Technical knowledge of the area assigned for evaluation, including experience working in the technical area
- Knowledge of performance-based assessment processes and methods
- Knowledge of facility-specific information.

The ORR teams do not include as senior members (including team leader) individuals from offices assigned direct line management responsibility for the work being reviewed; any exceptions require approval of the startup or restart authority. Additionally, no ORR team member should review work for which he or she is directly responsible. The ORR team leader determines and documents qualifications of ORR team members.

### *4.6.5 Criteria and Review Approaches*

DOE line management requires that the DOE ORR team determines (and ensures that the contractor's ORR team determines) the criteria and review approaches to be used for their review, based on the approved breadth given in their Plan-of-Action. The team documents the criteria and review approaches in their ORR implementation plan.

### *4.6.6 Approve and Use Implementation Plans*

DOE line management requires that the DOE ORR team leader approves (and ensures that the contractor's ORR team leader approves) their respective implementation plans and uses the implementation plans to conduct their ORRs.

### *4.6.7 Certification and Verification*

The following are prerequisites for starting the DOE ORR:

- DOE line management has received correspondence from the responsible contractor certifying that the facility is ready for startup or restart, and this has been verified by the contractor ORR/management review
- DOE line management has verified that the contractor's preparations for startup or restart have been completed
- DOE line management has certified that it meets the DOE plan-of-action that includes, as a minimum, the applicable DOE-specific core requirements.

At the start of the DOE ORR, all actions required for startup or restart are to be complete, with the exception of a manageable list of open pre-start findings that have a well-defined schedule for closure and allow review of the results by the DOE ORR team. In the certification and verification process, DOE Operations Office line management documents the actions taken to verify operations office and contractor readiness, including review of closure of contractor review findings, assessments of completion of defined prerequisites, and other assessments performed to ascertain readiness. Specific events significant to the startup and restart process that occur prior to the formal commencement of the DOE ORR (e.g., site emergency response drills, integrated equipment testing, etc.), may be reviewed by the DOE ORR team when they are conducted. A sample ORR/RA Readiness Review checklist is provided in Attachment 1.

### *2.6.8 Final Report*

Upon completion of the contractor or DOE ORR, DOE line management ensures a final report is prepared and approved by the ORR team leader. The final report documents the results of the ORR and makes a conclusion as to whether startup or restart of the nuclear facility can proceed safely. There is a statement in each ORR final report as to whether the facility has established an agreed upon set of requirements to govern safe operations of the facility. These requirements (1) have been formalized with DOE through the contract or other enforceable mechanism, and (2) have been appropriately implemented in the facility. If these requirements are not formalized and implemented, appropriate compensatory measures, formally approved, are to be in place during the period prior to full implementation and, in the opinion of the ORR team, maintain adequate protection of public health and safety, worker safety, and the environment. This conclusion shall be based on:

- Review of the program to document conformance to the agreed upon set of requirements, including a process to address new requirements
- Extensive use of references to the established requirements in the ORR documentation.

Additionally, the "lessons learned" section of the final report may relate to design, construction, operation, and decommissioning of similar facilities and future ORR efforts.

The core requirements, in aggregate, address many of the core functions and guiding principles of an Integrated Safety Management System The final report should include a statement

regarding the team leader's assessment of the adequacy of the implementation of those functions and principles, already addressed by the ORR at the facility undergoing review.

## 2.7 Action Tracking/Closure

Monitoring and verification of satisfactory closure of pre-start findings from both contractor and DOE reviews is a management responsibility. Adequate closure of all findings is also a DOE requirement. Findings, however, may be defined as pre-start and post-start to quantify the time in which the finding is to be resolved. As indicated by the title, pre-start findings are closed prior to obtaining DOE approval to start operations. Post-start findings may be competed following facility operation. However, in no case may a finding be ignored. Findings are identified in an action plan, along with a proposed response, a responsible individual and a completion date. All findings are tracked to closure. The team leader and team members may be required to assist in the verification or adequate resolution of pre-start findings. DOE Order 425.1A defines elements of the required process to close pre-start findings. This is accomplished by developing a closure package that is reviewed and certified by facility management and further reviewed by DOE management for findings from the DOE review. This process should be documented as a facility-wide requirement or within the individual ORR Implementation Plan. Closure packages should contain the following information:

- Each finding and the identification as pre-start or post-start
- The actions proposed in the Action Plan developed, submitted, and approved with the original completion schedule
- A brief description of the corrective actions taken and reasons for concluding that closure has been achieved
- Approval signatures of appropriate individuals
- DOE verification.

## 2.8 Specific Recommendations

In addition to the preceding information, some specific recommendations related to performing RA/ORR activities follow:

- Establish the scope of the readiness activity, document and control to avoid "scope creep"
- Contractor ORRs should not start prematurely. Readiness should be achieved before starting the review. ORRs are to verify readiness, not achieve readiness
- Reduce last minute perturbations by providing the implementation plan to oversight groups well ahead of the review
- When planning the ORR, include not only time for conducting interviews and observations, but also time to consolidate individual preparation, preparing forms, and analyzing data

- Early in the project, define the ORR prerequisites and core requirements or core objectives
- Avoid the temptation to constrain the end date when defining the critical path
- Site access training, facility walkthroughs, and document reviews are essential for team members to gain necessary familiarity with the project prior to initiation of the ORR
- The contractor should provide a complete set of surveillance procedures and authorization basis documents
- Team members should be dedicated for the duration of the review
- Partial certification packages cause confusion and added work. Analyze the lines of inquiry prior to assigning responsibility for certification package preparation to assure multiple organizations do not address the same question
- Clearly define interfaces between organizations at the beginning of the process to avoid conflict and confusion
- Secure early management support at the appropriate level to confirm necessary organizational support
- Facility management should assume responsibility and ownership of the readiness review process and be involved in planning and execution. That is, the readiness review process cannot be the responsibility of the project organization. At this point, a project is simply a resource to assist the facility owner
- A realistic, resource-loaded schedule should be prepared and maintained
- The lines-of-inquiry review and approval process should screen and eliminate inapplicable lines of inquiry
- Lines-of-inquiry should be separated as necessary to preferably apply to a single party
- Ensure lines-of-inquiry are clearly written and specific acceptance criteria are provided
- If possible, avoid parallel readiness review activities, i.e., owner, DOE
- All deficiencies, both Findings and Observations, are documented on a Deficiency Form and described in sufficient detail to assess the impact on readiness. This includes deficiencies corrected "on-the-spot"
- The RA/ORR schedule needs to be established consistent with a firm determination of when facility turnover will occur.

## 2.9 Lessons Learned

All ORR reports contain a lessons learned section. This information should be used by both the contractor and DOE to improve the ORR process. Lessons learned provide information concerning problems encountered by the review team, adequacies or inadequacies concerning the review, design and implementation, expertise, or other relevant factors or information that

may be used by future review teams. The ORR process may also identify lessons learned that are applicable to similar facilities. Lessons learned in areas such as operations, procedures, design or documentation may also be identified. A summary of lessons learned from previous ORRs is presented in Table 2.

**Table 2. ORR Lessons Learned**

| |
|---|
| Partial certification packages cause considerable confusion |
| Several organizations were required to answer the same line of inquiry |
| Where interfaces between the functional support group and the operating organization were mature and working well, certification packages of readiness were timely, well-prepared, and usually of high quality |
| Where interfaces were poorly defined and not agreed upon, the simple process of assigning responsibility was difficult, with the same issues being revisited many times |
| Some of the support organizations who were a provider of services to the facility as well as to similar facilities on an ongoing basis felt minimal responsibility for documenting their readiness to support this specific facility |
| None of the support organizations were given direction by facility personnel on the readiness review effort |
| There was no attempt to integrate responses nor assure that what the individual organizations did was compatible with facility needs or other responses |
| Management had little involvement early in the effort to determine readiness |
| A realistic, resource-loaded schedule should be provided and maintained |
| The large number of lines of inquiry (1,500) diluted the focus on important items. The review and approval cycle should catch and eliminate inapplicable lines of inquiry |
| Persons assigned responsibility for preparation of certification packages to answer lines of inquiry were frequently in the wrong organization, and had no interest in taking ownership |
| Line management (facility and operations) wasn't involved in certification package preparation until the review was nearly complete |
| It was unclear from the start who was responsible |
| More clearly written lines of inquiry along with specific acceptance criteria are important |
| Parallel processing of readiness information created extra work to ensure an independent, timely RA |
| Consideration should be given for future events to conduct a single independent readiness review, either by DOE or by the contractor, but not by both |
| An ORR can be completed in 6 days |
| All deficiencies, both findings and observations, must be documented on a deficiency form and described in sufficient detail to assess the impact on readiness. This includes deficiencies corrected on the spot |
| The schedule for the ORR needs to be established consistent with a firm determination of when turnover from construction will occur |

| |
|---|
| The daily debriefs need to include all ORR team members and facility management |
| The contractor ORR (management review) shouldn't start prematurely. Readiness should be achieved before starting the review. ORRs are to be used to verify readiness, not to achieve readiness |
| Closure of corrective actions can be ensured by preparing closure packages and applying effort and detail commensurate with or greater than the initial assessment |
| The ORR is not and should not be a substitute for a routine independent assessment or self-assessment |
| When planning the ORR, include not only the time on-site for conducting interviews and observations, but also time to consolidate individual thinking and analyze data in order to present coherent and informative conclusions |
| The duration of an ORR should not exceed 2 weeks, including report preparation |
| The most common problem is late approval of the safety basis documentation which prevents putting the implementing procedures in place and completing operator training and qualification |
| Early in the project, define the ORR prerequisites and core requirements or core objectives |
| Ultimately, the success of the project will depend on the accuracy with which the ORR prerequisites are identified, defined, tracked, and verified complete |
| The temptation to conduct the ORR in parallel with achieving readiness should be avoided |
| Begin with the end in mind |
| Inadequate validation and verification of operational or maintenance/surveillance procedures which are newly prepared or recently modified |
| Site access training, walkthroughs, and document reviews are essential for team members to gain the necessary familiarity with the project prior to the kickoff of the ORR |
| Get agreement between the facility contractor and the DOE during development of the ORR plans, on the details of the operations that are available for demonstration |
| Give the plan-of-action and the implementation plan to oversight groups (EH, DNFSB, state agencies) as soon as possible |
| The value and effectiveness of the ORR/RA can be significantly decreased by ineffective corrective actions to resolve the issues identified during the ORR/RA |
| The surveillance actually tests the function or protective action upon which the safety basis depends. |

## ATTACHMENT 1. ORR/RA READINESS CHECKLIST

The following queries are appropriate when reviewing a project in preparation for an RA/ORR. When appropriate, provide explanatory comments or qualifiers to support verified answers.

(DOE Order 425.1, Operational Readiness Reviews; DOE-Standard-3006-95, Planning and Conduct of Operational Readiness Reviews (0.2.21, November 1995; DOE Manual 251.1-1)

| Checklist Questions | Yes | No | Comments |
|---|---|---|---|
| **A. Preparations** | | | |
| 1. Current project documents identified, organized, centrally located, accessible and retrievable? | | | |
| 2. Individual identified as interface with ORR team? | | | |
| 3. Contractor management assessment completed and corrective actions completed? | | | |
| 4. Plan-of-Action prepared based on tailoring, hazard category, and hazard class? | | | |
| 5. Prerequisites identified and completed? | | | |
| 6. Readiness to proceed memorandum (declaration of readiness to operate) prepared and approved? | | | |
| 7. Preparations complete for ORR team support: | | | |
| a. Offices and meeting space identified? | | | |
| b. Furnishings provided? | | | |
| c. Telephone, copy machines, computers, printers, and fax machines provided? | | | |
| d. Communications plan including daily meetings prepared? | | | |
| 8. Plan for follow-up communication with ORR team prepared? | | | |
| 9. Action tracking/closure methodology identified? | | | |
| 10. Final ORR report reviewed for recommendations and observations for improvement? | | | |
| **B. Core Requirements** | | | |
| 1. Adequate and correct procedures prepared and safety limits identified for operating and process systems and utility systems? | | | |
| 2. Training and qualification programs for user personnel established, documented and implemented? (The training and qualification program encompasses the range of duties and activities required to be performed.) | | | |
| 3. Level of knowledge of user personnel adequate based on reviews of examinations and examination results, and selected interviews with operating and operations support personnel? | | | |
| 4. Facility safety documentation in place that describes the “safety | | | |

| Checklist Questions | Yes | No | Comments |
|---|---|---|---|
| envelope" of the facility? Safety documentation characterizes the hazards/risks associated with the facility and identifies mitigating measures (systems procedures, administrative controls, etc.) that protect workers and the public from those hazards/risks. Safety systems and systems essential to worker and public safety defined and a system to maintain control over the design and modification of facilities and safety-related utility systems established? | | | |
| 5. A program in place to confirm and periodically reconfirm the condition and operability of safety systems, including utility systems? | | | |
| 6. A process established to identify, evaluate, and resolve deficiencies and recommendations made by oversight groups, official review teams, and audit organizations? | | | |
| 7. A systematic review of the facility's conformance to applicable DOE Orders performed, and any non-conformances identified? Schedules for obtaining compliance justified in writing and approved? | | | |
| 8. Management programs established, sufficient numbers of qualified personnel provided, and adequate facilities and equipment available to ensure operational support services adequate for operations, (e.g., training, maintenance, waste management, environmental protection, industrial safety and hygiene, radiological protection and health physics, emergency preparedness, fire protection, quality assurance, criticality safety, and engineering)? | | | |
| 9. A routine and emergency operations drill program established and implemented? | | | |
| 10. An adequate startup or restart test program developed that includes adequate plans for graded operations testing to simultaneously confirm operability of equipment, viability of procedures, and training of user personnel? | | | |
| 11. Functions, assignments, responsibilities, and reporting relationships clearly defined, understood, and effectively implemented with line management responsibility? | | | |
| 12. The implementation status for DOE Order 5480.19, Conduct of Operations Requirements for DOE Facilities, adequate for operations? | | | |
| 13. Sufficient number of qualified and trained personnel available to support safe operations? | | | |
| 14. A program established to promote a site-wide culture in which personnel exhibit an awareness of public safety, health, and environmental protection requirements and, through their actions, demonstrate a high-priority commitment to comply with these requirements? | | | |
| 15. Facility systems and procedures, as affected by facility modifications, consistent with the description of the facility, procedures, and accident analysis included in the safety basis? | | | |

| Checklist Questions | Yes | No | Comments |
|---|---|---|---|
| 16. The technical and managerial qualifications of those personnel at the DOE Field organization (including Facility Representatives), and at DOE Headquarters who have been assigned responsibility for providing direction and guidance to the contractor, are adequate (DOE ORR only)? | | | |
| 17. The breadth, depth and results of the contractor review are adequate to verify the readiness of hardware personnel, and management programs for operations (DOE ORR only)? | | | |
| 18. Proposed modifications to the facility reviewed for potential impacts on procedures and training and qualification? Procedures revised to reflect these modifications and training performed to these revised procedures? | | | |
| 19. Technical and management qualifications of personnel responsible for facility operation and maintenance adequate? | | | |
| 20. DOE Operations Office oversight programs, such as occurrence reporting, facility representative, corrective action, and quality assurance programs adequate (DOE ORR only)? | | | |
| **C. Core Objectives** | | | |
| 1. Facility safety documentation describes the safety envelope of the facility? | | | |
| 2. Safety documentation characterizes hazards and risks, and identifies mitigating measures to protect workers, the public and the environment from the characterized hazards? | | | |
| 3. Safety systems defined in the facility safety documentation? | | | |
| 4. Adequate and correct safety limits for operating systems? | | | |
| 5. Programs to control the design and modification of facilities and safety-related utility systems in place? | | | |
| 6. Facility systems, as affected by facility modifications, consistent with the description of the facility, procedures, and accident analysis included in the safety basis? | | | |
| 7. Adequate and correct procedures for operating systems and utility systems prepared and validated? | | | |
| 8. Proposed modifications to the facility reviewed for potential impacts on procedures, and procedures revised to reflect approved modifications? | | | |
| 9. Facility procedures, as affected by facility modifications, consistent with the description of the facility, procedures, and accident analysis included in the safety basis? | | | |
| 10. A program in place to confirm and periodically reconfirm the condition and operability of safety systems, safety-related process systems, and safety-related utility systems? | | | |
| 11. Safety systems and other instruments that monitor Technical Safety Requirements checked for calibration? | | | |
| 12. All safety and safety-related utility systems currently operational and in a satisfactory condition? | | | |

| Checklist Questions | Yes | No | Comments |
|---|---|---|---|
| 13. Training and qualification programs established, documented, and implemented that cover the range of duties required to be performed by operations personnel? | | | |
| 14. Technical qualifications of contractor personnel responsible for facility operations adequate? | | | |
| 15. Proposed modifications to the facility reviewed for potential impacts on training and qualification? | | | |
| 16. Training performed to approved procedures? | | | |
| 17. Level of knowledge of operations personnel adequate based on reviews of examinations, exam results, selected interviews, and observation of work performance? | | | |
| 18. Sufficient numbers of qualified personnel to support safe operations? | | | |
| 19. Personnel exhibit an awareness of public and worker safety, health, and environmental protection requirements and, through their actions, demonstrate a high-priority commitment to comply with these requirements? | | | |
| 20. An emergency drill program, including program records, established and implemented? | | | |
| 21. A routine operations drill program, including program records, established and implemented? | | | |
| 22. Managerial qualifications of user personnel responsible for facility operations adequate? | | | |
| 23. Functions, assignments, responsibilities, and reporting relationships clearly defined, understood, and effectively implemented with line management responsible for control of safety? | | | |
| 24. A process established to identify, evaluate, and resolve deficiencies and recommendation made by oversight groups, official review teams, audit organizations, and the user? | | | |
| 25. A systematic review performed of the facility's conformance to applicable DOE Orders? | | | |
| 26. Non-conformances to applicable DOE Orders justified, or schedules for gaining compliance justified in writing and formally approved? | | | |
| 27. An adequate startup or restart test program developed that includes adequate plans for graded operations testing to simultaneously confirm operability of equipment, viability of procedures, and training of user personnel? | | | |
| 28. A program established to promote a site-wide safety culture? | | | |
| 29. The breadth, depth and results of the responsible contractor management review adequate to verify readiness of hardware, personnel, and management programs for operations (DOE ORR only)? | | | |
| 30. Technical and managerial qualifications of DOE field organization | | | |

| Checklist Questions | Yes | No | Comments |
|---|---|---|---|
| personnel and Facility Representatives assigned responsibility for providing direction and guidance to the contractor adequate (DOE only)? | | | |
| 31. Area/Operations Office oversight programs such as occurrence reporting, facility representative, corrective action, and quality assurance programs adequate (DOE ORR only)? | | | |
| **D. Support Programs** | | | |
| 1. Management programs established, sufficient numbers of qualified personnel provided, and adequate facilities and equipment available to ensure support services adequate for operations? | | | |
| 2. Training and Qualification programs for user personnel that cover the range of duties to be performed established, documented, and implemented? | | | |
| 3. Level of knowledge of user personnel adequate based on reviews of examination, exam results, selected interviews, and observations of work practices? | | | |
| 4. The following support programs are included in the review, as applicable: | | | |
| a. Fire Protection | | | |
| b. Industrial Safety and Health | | | |
| c. Radiation Protection | | | |
| d. Maintenance | | | |
| e. Engineering Support | | | |
| f. Quality Assurance | | | |
| g. Criticality Safety | | | |
| h. Training | | | |
| i. Environment | | | |
| j. Waste Management | | | |
| k. Emergency Preparedness | | | |
| **E. Closeout** | | | |
| 1. Findings documents prepared and issued? | | | |
| 2. Corrective actions, responsible individuals, and completion dates identified? | | | |
| 3. Final DOE report received, reviewed, and understood? | | | |
| 4. Lessons learned documented and reported? | | | |